

## **Protection of LID IMPs During Construction**

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### **Purposes.**

Protection of LID integrated management practices (IMPs) from sediment and compaction requires appropriate construction planning and sequencing to minimize exposure to damaging activities and comprehensive temporary erosion and sediment control. Once installed, LID IMPs are susceptible to sedimentation and compaction until all construction is complete and the project site has been permanently stabilized. Briefing contractors before and during construction, as well as installation of temporary erosion and sediment (TES) controls and protective fencing during all phases of construction is necessary to assure the long-term function of the LID IMPs.

In the event of transitions between construction site management, TES controls and protective fencing shall be installed by the outgoing contractor prior to the transition. A site plan drawing indicating locations of LID IMPs, TES controls and protective fencing shall be provided by the outgoing contractor to the site owner. The site owner shall furnish copies of the site drawing to the incoming contractor. The incoming contractor shall maintain and repair the TES controls as necessary until job completion or subsequent contractor transition. In the event of delays between contractor transitions, it shall be the site owner's responsibility to regularly inspect and repair TES controls. This may be accomplished via contractual agreements with the outgoing contractor.

### **General Protection Measures.**

Storage or staging of construction and landscaping materials and equipment is prohibited on pervious pavements and within vegetated LID IMPs. Pervious pavements, vegetated IMPs, their side slopes and entrance and exit structures shall remain free of all materials and equipment during all phases of construction excluding materials installed for protection purposes.

Access in pervious areas shall be limited or prohibited as follows:

- Vehicular and heavy equipment access over pervious pavement subgrades shall be limited to activities necessary for subgrade preparation and approved by the engineer.
- Vehicular and heavy equipment access over wearing courses is prohibited until pavement is sufficiently cured.
- Vehicular and heavy equipment access through vegetated IMPs is prohibited.
- Pedestrian access into vegetated IMPs shall be limited to necessary activities including subgrade preparation, under-drain, flow entrance and outfall installation and planting operations.
- All other pedestrian access into vegetated IMPs is prohibited unless approved by the Engineer.

Debris, chemicals, sediment or sediment-containing runoff shall not be directed toward pervious pavements. Temporary erosion and sediment controls shall be used to prevent construction or sediment containing runoff from entering vegetated IMPs. Where no practical method to direct sediment laden construction flows away from vegetated BMP's exists, an approved plan for sediment removal, soil rehabilitation, infiltration verification and completion shall be provided by the engineer.

Airborne dust shall not be allowed to deposit or collect on pervious pavements.

In existing vegetated areas, pruning shall be allowed only as necessary for safe equipment operation and as approved by the project arborist, forester, or landscape architect.

Soils in areas outside of planned roads, permanent structures, parking areas, construction envelopes, and vegetated IMPs shall be protected from compaction resulting from heavy equipment and materials storage/staging.

### **Required Controls.**

The following provides a basic set of TESC controls shall be used to protect LID IMPs. Additional controls (e.g. chitoan sand, coagulation techniques and soil polymers) may be necessary depending on site conditions.

**1. Temporary berms, ditches, culverts, compost cover, seeding, and sediment ponds.**

- a. These facilities and strategies shall be used to manage site runoff and prevent sediment-laden runoff from entering or crossing vegetated IMPs or pervious pavements. Design, construction, installation, and maintenance of berms, ditches, culverts, compost application, seeding and sediment ponds shall be in accordance with local erosion and sediment control regulations or the Department of Ecology Stormwater Management Manual for Western Washington (most recently adopted version), whichever is more stringent.

**2. Geotextile fabric and plastic sheet covering.**

- a. Following curing, at a minimum pervious pavement shall be covered with geotextile fabric and plastic sheeting to prevent accumulation of particulates and debris. Fabric and sheeting shall be maintained in place using sandbags on ropes with a minimum 10-foot grid spacing in all directions. All seams shall be taped or weighted along the entire seam length. There shall be at least a 12-inch overlap of all seams. If covering is used on a slope that has not been permanently stabilized, the up-slope end shall be secured and buried in a 6-inch deep trench with the soil firmly tamped against the covering. The contractor shall inspect coverings daily for rips and uplift. Patch damaged areas with new covering extending 24-inches beyond the damaged area in all directions and fasten to the base covering by taping or secure with a continuous line of sand bags along all edges. Refasten uplifted areas by doubling the original quantity of fasteners. Contact between covering and the ground should always be maintained. Covering may be removed upon completion of all construction phases and/or approval by the Engineer.

**3. Protective Fencing.**

- a. Orange construction fence shall be used to delineate areas to be protected and off limits from traffic, storage, staging, and disposal. At a minimum, protected areas include naturally vegetated areas, pervious pavements, vegetated LID IMPs, and general landscaped areas including planter beds, lawns and playfields. Fencing materials, installation, and maintenance shall be in accordance with BMP C103: High Visibility Plastic or Metal Fence, as described in the Stormwater Management Manual for Western Washington, Volume II, or in accordance with local standards, whichever is more stringent. Fencing shall be inspected daily during active construction.

**4. Curb Cuts.**

- a. Curb cuts designed to channel water into vegetated LID IMPs shall be covered to prevent sediment entry. Place a ¾-inch plywood board to the inside of the curb cut. The board shall extend a minimum of 3-inches to either side of the curb cut, to the top of the curb cut, and 1-foot below the bottom of the curb cut opening. The bottom of the board shall be secured in place by inserting it between the concrete and soil. The top of the board shall be secured with sand bags placed against the side of the board opposite the curb cut opening. The sand bags shall overlap both ends of the board to limit sediment entry around the edges, and shall be placed along the entire length of the board on the side opposite the curb cut. At a minimum, curb cut covers shall be inspected and repaired as needed after each rainfall event and daily during active construction.

**5. Filter Fencing, straw and compost waddles or berms and coir, jute or straw mats.**

- a. Filter fencing shall be used at all entry-points around vegetated IMPs, excluding curb cuts, and along the sides of vegetated IMPs where adjacent land area has no slope or slopes toward the BMP. Filter fencing is not necessary if adjacent land areas slope away from the vegetated LID BMP or has been permanently stabilized against erosion AND no upgradient construction activities are planned that may direct sediments toward the BMP. Filter fence materials, installation, and maintenance shall be in accordance with BMP C233: Silt Fence, as described in the Stormwater Management Manual for Western Washington, Volume II, or

in accordance with local standards, whichever is more stringent. The following requirements are in addition to BMP C233:

- i. The geotextile at the bottom of the fence shall be buried in a trench to a minimum depth of 6-inches below ground surface.
- ii. Excavation for installation of sediment fence within the dripline of trees and other vegetation to be retained shall be approved by the Engineer prior to trenching and shall circumvent critical root zones unless specifically approved by the Engineer.
- iii. At a minimum, filter fencing shall be inspected after each rainfall event and daily during active construction.

## **Remedies.**

If protection measures fail, or site activities result in damage to LID IMPs, remedies shall be required.

### **1. Pervious pavement.**

- a. De minimus quantities of sediment or particulate that accumulate on pervious pavement may be removed via vacuum sweeping or pressure washing. Visible particulate or sediment that cumulatively cover 10% or less of the pervious surface are considered de minimus.
- b. Accumulations greater than de minimus quantities shall be removed via vacuum sweeping or pressure washing. Maintenance should be verified with field infiltration testing. One field test procedure is as follows:
  - i. Attach one end of a 24-inch cylinder to the pavement using plumber's putty.
  - ii. Have a stop watch ready
  - iii. Pour 5 liters of water into the cylinder and record the length of time the water takes to infiltrate
  - iv. Repeat the test 2 more times and calculate the average
  - v. If the pavement is badly clogged, a better seal may be required. In this case, use a silicon or latex sealant
  - vi. If the tested infiltration capacity is 50% or less of the designed infiltration capacity
    1. Perform additional maintenance and retest the pavement
    2. Replace the poorly performing pavement if maintenance procedures cannot restore performance to better than 50% of the engineer's specification.
- c. If the structural integrity of pervious pavements is damaged during construction activities, the pavement shall be removed, replaced, and the new areas retested per engineer's specifications.

### **2. Vegetated LID IMPs.**

- a. If de minimus quantities of sediment accumulate in vegetated LID IMPs, the upper 3-inches of material shall be removed from the area influenced by sediment. De minimus quantity is ½-inch or less of sediment accumulated over any portion of the facility. The upper 1/2-inch of material shall include the accumulated sediment plus facility soil or rock at flow entrances or outfall. If more than ½ -inch of sediment is observed in the facility, then all sediment plus 6 inches of bioretention soil mix or rock at flow entrances or outfall shall be removed from area influenced by sediment and the project engineer shall verify if the facility meets designed infiltration criteria. Removed soils shall be replaced with bioretention soils equivalent to those defined by BMP T3.70: Bio-Infiltration Swale in the Stormwater Management Manual for Western Washington, Volume IV (most recently adopted version). Vegetation damaged or destroyed by construction or sediment removal activities shall also be replaced with equivalent plant materials.
- b. If soils in vegetated IMPs are compacted during construction activities by heavy equipment or materials storage the soil infiltration rate shall be tested. If compaction has reduced the soil infiltration rate below the rate used for facility design, the full LID BMP soil profile shall be replaced. Replacement soils shall be installed following original project design requirements and specifications. The soil infiltration rate shall be verified following installation.